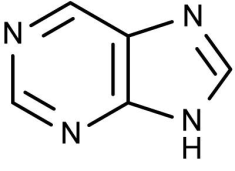
Dan Feldman

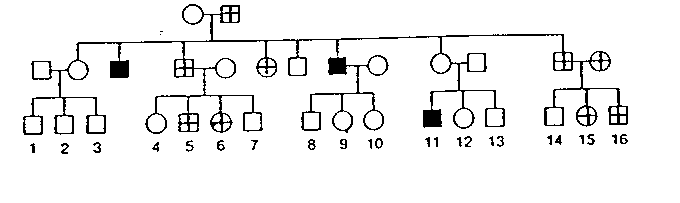
***Note: I wrote up these questions using our lecture slides from last year. While they are very similar—and often identical—to the ones used this year, some may vary slightly, so a couple of the questions on here might not have been covered in your lectures. If you find any errors or have any questions, please let me know. Also note that the difficulty of the genetics problems may be different from what you see on the exam.***

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1. Identify the structure shown above.
2. Adenine
3. Guanine
4. Thymine
5. Cytosine
6. None of the above
7. Which of the following is not a genetic cause of gout?
8. Von Gierke’s Disease
9. Increased salvage of purines
10. Increased PRPP production
11. Glycogen Storage Disease
12. All are genetic causes of gout.
13. Which of the following would not be a major end product of cytosine catabolism?
14. β-Alanine
15. β-Aminoisobutyrate
16. CO2
17. NH3
18. All are products of cytosine catabolism.
19. Which of the following statements is true regarding the digestion of Vitamin B12?
20. An intrinsic factor binds B12 in the intestine
21. B12 that enters circulation is bound to Transcobalamin I
22. B12 that is stored in the liver is bound to Transcobalamin II
23. A and B are true
24. A, B, and C are true
25. The folate coenzyme 5,10-methylene THF is used by which enzyme(s)
26. Methionine synthase and Thymidylate synthase
27. Formyl transferase and Thymidylate synthase
28. Methionine synthase and SHMT
29. Thymidylate synthase and SHMT
30. Methionine synthase and Formyl transferase
31. Which of the following findings would be inconsistent with a Vitamin B12 deficiency?
32. Homocysteinemia
33. A strict vegetarian diet
34. A microcytic anemia
35. Insufficient nucleotide synthesis
36. None of the above
37. Consider Molecule A, a DNA molecule that contains 6000 bases. If the number of thymine in the molecule is 2000, what is the percentage of cytosine in Molecule A?
38. 33.4%
39. 16.7%
40. 66.6%
41. 83.3%
42. None of the above
43. Fragile X Syndrome results from a \_\_\_\_\_\_ repeated motif in the 5’ untranslated region of the FMR1 gene.
44. GAC
45. CAG
46. CGG
47. CCG
48. TAG
49. In the Meselson-Stahl experiment, which mode of replication can be eliminated based on data derived after one generation of replication?
50. Conservative
51. Semiconservative
52. Dispersive
53. All of the above
54. None of the above
55. What activity of DNA Polymerase I is responsible for the removal and replacement of the DNA primer during DNA replication?
56. 5’ to 3’ exonuclease
57. 3’ to 5’ exonuclease
58. 5’ to 3’ polymerase
59. 3’ to 5’ polymerase
60. None of the above
61. Which of these is the first enzyme involved in the process of Base Excision Repair?
62. An endonuclease
63. DNA ligase
64. DNA polymerase
65. DNA glycosylase
66. Telomerase
67. Which of these is false regarding the rho protein?
68. Structurally, it is a tetramer.
69. Its function in RNA transcription is ATP-dependent.
70. It is involved in the termination of transcription.
71. It functions with hairpin structures.
72. All of the above are true.
73. Which statement is true regarding transcription inhibitors?
74. Rifampicin binds to the alpha subunit of prokaryotic RNA polymerase.
75. Alpha-Amantin inhibits both eukaryotic polymerase II and III.
76. Actinomycin D inhibits both prokaryotic and eukaryotic transcription.
77. Two of the above are true.
78. A, B, and C are all true.
79. Which statement is true?
80. Mitochondrial DNA contains no introns.
81. Exons may contain coding and noncoding RNA sequences.
82. The initial transcript of a gene is called hnRNA.
83. Two of the above are true.
84. A, B, and C are all true.
85. Which statement is true?
86. The monomer size in prokaryotes is 80S.
87. In the structure AUA is a termination codon in mammalian cells.
88. Polysomes are found only attached to the membranes of the endoplasmic reticulum.
89. The start codon codes for the amino acid Methionine.
90. None of the above.
91. The wobble hypothesis involves
92. tRNA
93. mRNA
94. rRNA
95. Both mRNA and rRNA
96. Both mRNA and tRNA

For questions 17-19, choose the stage of meiosis that corresponds to the given description.

1. A nuclear envelope forms around each set of chromosomes and cytokinesis occurs, producing four daughter cells, each with a haploid set of chromosomes.
2. Prophase I
3. Metaphase I
4. Anaphase I
5. Telophase I
6. Prophase II
7. Metaphase II
8. Anaphase II
9. Telophase II
10. Cytokinesis
11. The two chromosomes in each bivalent separate and migrate toward opposite poles.
12. Prophase I
13. Metaphase I
14. Anaphase I
15. Telophase I
16. Prophase II
17. Metaphase II
18. Anaphase II
19. Telophase II
20. Cytokinesis
21. The maternal and paternal chromosomes of each homologous pair separate and reach the poles of the cell, nuclear envelopes form around them, and cytokinesis follows to produce two cells.
22. Prophase I
23. Metaphase I
24. Anaphase I
25. Telophase I
26. Prophase II
27. Metaphase II
28. Anaphase II
29. Telophase II
30. Cytokinesis
31. If a diploid cell entering meiosis has 6 chromosome pairs, what is the number of possible chromosome combinations in the haploid nuclei?
32. 64
33. 36
34. 24
35. 12
36. 128
37. In the system of chromosome classification, chromosomes 16 and 17 belong to which group?
38. C
39. D
40. E
41. F
42. G
43. An individual with full tetrasomy has how many chromosomes?
44. 45
45. 46
46. 47
47. 48
48. 49



For questions 23-24, refer to the above pedigree, where two different genetic diseases are observed. A cross represents the occurrence of an extra finger and a black square represents the occurrence of an eye disease.

1. What is the most likely pattern of inheritance for the occurrence of an extra finger?
2. Autosomal dominant
3. Autosomal recessive
4. X-linked dominant
5. X-linked recessive
6. Y-linked
7. What is the most likely pattern of inheritance for the occurrence of an eye disease?
8. Autosomal dominant
9. Autosomal recessive
10. X-linked dominant
11. X-linked recessive
12. Y-linked
13. Infantile amaurotic idiocy is a serious mental defect occurring in individuals homozygous for a recessive gene. Two normal parents have a daughter with symptoms of this disease, and a normal son. The son marries a normal woman, whose brother was also affected by this same disorder. What is the probability that the son is a carrier of the recessive gene?
14. 2/3
15. 3/4
16. 1/3
17. 1/4
18. 1
19. Refer back to question #25. Consider the marriage of the son and the normal woman. What is the probability that their first child will be affected?
20. 2/9
21. 1/9
22. 4/9
23. 1/3
24. 1/4
25. In the assembly of a recombinant DNA molecule, which enzyme is used to glue together two pieces of DNA?
26. Taq polymerase
27. T4 DNA ligase
28. Topoisomerase II
29. Reverse transcriptase
30. EcoRI restriction endonuclease
31. Which statement is true regarding gene therapy?
32. Nonviral systems are more efficient for gene delivery than viral systems
33. Nonviral systems elicit a stronger host immune response than viral systems
34. Nonviral systems are more cost-effective than viral systems
35. Eukaryotic expression vectors are constructed on prokaryotic plasmids
36. None of the above
37. A child has blood type A, and his mother has type AB. Which of the following genotypes would exclude a male from being the father?
38. AO
39. AB
40. BO
41. OO
42. None of the above
43. If the frequency of the “a” allele in a Hardy-Weinberg population is 0.1, what percentage of individuals are Aa?
44. 10%
45. 18%
46. 20%
47. 28%
48. 35%
49. In a Hardy-Weinberg population, 51% of individuals carry at least one copy of the recessive allele. What is the predicted frequency of individuals that express the dominant phenotype?
50. 0.42
51. 0.49
52. 0.51
53. 0.75
54. 0.91
55. What is the coefficient of inbreeding in a situation where 4 matings are involved?
56. 1/8
57. 1/16
58. 1/32
59. 1/64
60. 1/128
61. 1000 gametes from an individual are scored, and the results are as follows: ABc=360, AbC=55, Abc=95, aBC=105, aBc=45, abC=340.

What is the recombination frequency between loci A and B?

1. 0.1
2. 0.2
3. 0.3
4. 0.4
5. 0.5
6. Consider a species where the females show no recombination, but the males do. Consider two loci with a recombination fraction of 0.1. In a cross of an AB/ab female and an Ab/aB male, what is the probability of an AaBb offspring?
7. 0.05
8. 0.1
9. 0.25
10. 0.45
11. 0.5
12. Hereditary Hemochromatosis is a disease that illustrates
13. Autosomal dominant inheritance
14. Variable expressivity
15. X-linked inheritance
16. Incomplete penetrance
17. None of the above
18. Duchenne muscular dystrophy illustrates what mode of inheritance?
19. Autosomal dominant
20. X-linked dominant
21. Y-linked
22. Autosomal recessive
23. X-linked recessive
24. In a cross between a black-skinned individual and a white-skinned individual, the children will be intermediate in color. This is an example of
25. Incomplete penetrance
26. Incomplete dominance
27. Variable expressivity
28. Epistasis
29. Partial recessiveness